

## Temperature corrections for mechanically graded lumber

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### **Abstract**

The continuous lumber tester (CLT) is the most widely used grading machine in the world. With the CLT, the flatwise bending stiffness of lumber is measured as it passes through the machine. The modulus of elasticity (MOE) is calculated from the force required to bend the lumber to a fixed deflection of 7.94 mm (5/16 in.), and this MOE is used in assigning a machine grade. Quality control testing is also required to assure proper grade assignment. Usually, quality control is based on tests of bending stiffness and strength. In commercial practice, the lumber passing through the CLT may still be hot from drying. In cold climates, the lumber could also be frozen when passing through the machine or when quality control tests are conducted. Unless allowances are made for the temperature of the

lumber, problems may occur in grade assignment or during quality control testing.

Research at the Forest Products Laboratory has established the effect of temperatures ranging from  $-26^{\circ}\text{C}$  ( $-15^{\circ}\text{F}$ ) to  $66^{\circ}\text{C}$  ( $150^{\circ}\text{F}$ ) on the MOE of both dry and green lumber. For lumber at 12 percent moisture content (MC), the relationship is linear, with no inflection in the MOE-temperature relationship near  $0^{\circ}\text{C}$  ( $32^{\circ}\text{F}$ ). For green lumber, a segmented linear relationship was found. The slope of this relationship is steeper below  $0^{\circ}\text{C}$  ( $32^{\circ}\text{F}$ ) than above. Below  $-18^{\circ}\text{C}$  ( $0^{\circ}\text{F}$ ), the increase in MOE with decreasing temperature may be a function of the actual green MC. Above  $0^{\circ}\text{C}$ , the relationship is independent of the green MC. An analytical model is developed to predict change in MOE with change in temperature at all MC levels and for temperatures between  $-18^{\circ}\text{C}$  ( $0^{\circ}\text{F}$ ) and  $66^{\circ}\text{C}$  ( $150^{\circ}\text{F}$ ).

A new digital data processor has been introduced for the Metriguard CLT and HCLT machines. Approximately a dozen of these units have been placed in service. A temperature detection system is being developed in which the wood temperature will be measured and used to

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*Proceedings of the*  
**Eleventh International Symposium on  
Nondestructive Testing of Wood**

*September 9-11, 1998  
Madison, Wisconsin*

*Sponsored by  
Washington State University  
College of Engineering and Architecture  
Wood Materials and Engineering Laboratory  
Dept. of Civil and Environmental Engineering  
Conferences and Institutes  
Pullman, Washington*

*and*

*USDA Forest Products Laboratory  
Madison, Wisconsin*

*Proceedings published by the Forest Products Society  
Madison, Wisconsin  
1999*

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Washington State University gratefully acknowledges the financial support for this Symposium from Weyerhaeuser, Inc. and Metriguard, Inc.

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